WASTE STREAM – Non Ferrous Metals Industry Wastes

Introduction

There are serious concerns regarding the future of the non ferrous metals industry in the UK following the implementation of the Landfill Regulations 2002. The non-ferrous metals industry turnover is about £4.5 billion and it employs about 36 000 people in some 330 firms. A few of these are large national and international companies, but the majority are small or very small. The case study uses examples from the aluminium and lead sectors to illustrate the real concerns for the whole of the non ferrous metals industry.

The non-ferrous metals industry actively contributes to both **reduction** and **recovery** of hazardous waste. Metals are inherently re-usable and recyclable with full retention of metallurgical properties and our members develop every possible opportunity to reuse and recycle waste products from their processes. The volumes of recycled material used are substantial and increasing. Metal recycling reduces the amount of material for waste management. However, there will always be a residual waste, which must be managed. In addition to recycling and reuse being environmentally beneficial, it will also largely be the best commercial option. However, in some instances, technological solutions have not been found or are not commercially available for reuse or for recycling wastes to beneficial use. If the residual waste from recycling cannot be managed then the recycling industry cannot survive.

The primary aluminium industry directly employs around 2000 people with an equivalent indirectly employed. These plants are located in areas where alternative employment is limited. Aluminium recycling recovers 95% of the initial energy invested in making the primary metal. The demand for aluminium, partly because of its environmentally beneficial properties such as reduced weight, is rising. Any aluminium melting process whether primary, recovery or casting will generate dross. The issues discussed in this case study will therefore pose a threat to the whole of the aluminium industry. The continued success and viability of the UK aluminium producing, processing and recycling sector is critical for the environmental benefits to continue to be realised.

The secondary lead industry has an extremely successful track record in recycling greater than 90% of the waste automotive battery arisings in the UK, and a large percentage of the lead roofing sheet, which is now under threat. The success of the sector depends on the collection and treatment costs being less than the residual value of the waste stream. Treatment volumes of ferrous and non-ferrous scrap are essential to the continued profitability of the collection and treatment facilities which are experiencing intense financial pressures to remain viable. This is at a time when legislation is demanding greater recycling rates for all types of materials. These industries do, however, need to invest heavily to ensure that impending legislation and regulations are complied with in order to remain viable. Increased environmental costs with a static revenue stream, is making these investment decisions very difficult and this has been a major influence in the decision-making process leading to the loss of recycling facilities. Closures within the sector put further financial constraints on the rest of the recovery and recycling industries, and could damage what is currently a successful business sector which already achieves a greater recycling rate than European targets currently require.

The non-ferrous metals industry is facing a waste management crisis as a result of the implementation of the Landfill Regulations 2002. Indications from the Environment Agency are that around 10 sites will accept hazardous waste on a commercial basis, and a possible 30 sites with in-house waste from industrial plant.

The Industry recognises that alternative solutions must be sought for those wastes currently landfilled and is committed to continuing to seek new alternatives. Projects associated with finding alternatives have been ongoing for several years and in the UK lead industry alone £2m has been spent to date with no technical solution found.

In some cases the very basis for the recycling industry is threatened by the timescales for introduction of the Landfill Regulations. The reality of the situation is that metals recycling will only be carried out where it is more economical than primary product to produce. Technical solutions are being sought; however, despite industry activity and investment since before 1990, additional time for implementation and commercial realisation of these solutions is needed. If there is no route for a hazardous waste stream, and no technical alternative to landfill, this will have serious consequences for the processes producing this waste.

The geographical spread of hazardous waste landfill sites will not be uniform across the country. As well as creating a competitive disadvantage for those operators not situated near to a hazardous waste landfill, this will force environmentally damaging amounts of road transport activity with the associated high costs.

Waste Acceptance Criteria for hazardous wastes to hazardous landfill or for stable non-reactive hazardous waste to non-hazardous landfill were not determined until December 2002. Indeed some methodologies for sampling and testing of parameters such as Acid Neutralisation Capacity are, at the time of writing, not determined for individual waste streams. The option to treat hazardous waste to become stable and non reactive, by say, fixing with cement, is also uncertain as the Waste Acceptance Criteria for monolithic wastes have not been determined. This is most critical to the primary aluminium industry as the main waste from this process, Spent Pot Lining (SPL), is monolithic. Investment decisions by any company have to be made on the basis of fact. Even if this sort of treatment were possible the investment would need to be justified to shareholders. Without a guarantee that such activities would satisfy the requirements once fully determined, companies are faced with no clear options for investment. In addition to the investment uncertainty, it has already been recognised that there is a long lead-time for implementation of hazardous waste treatment facilities or increased capacities at existing facilities.

Current advice from the regulators is that industry must find solutions through waste minimisation and contingency plans for where solutions do not exist and have suggested storage as a possible option. Implementation of the Landfill Regulations, without the potential for the risk assessment allowed for in Council Decision 2003/33/EC, could lead to the only option available being storage in the short time remaining. The operations producing the residual waste will be controlled by IPPC permits and waste storage will probably not be acceptable at their sites. Indeed stockpiles of hazardous waste are not acceptable to the Industry either from an environmental liability stance. Environmental liability is clearly a critical concern for shareholders. If it is not possible to treat, landfill or store the residual waste from the

recycling processes then operations will stop and sites will close. This would happen rapidly – in some cases within a week of the landfill option being removed without suitable treatment facilities being in place.

For the battery recycling industry this will lead to 8.5 million waste automotive (cars and lorries) and standby power batteries with no recovery option in the UK. This has very serious implications, as the only alternative would be to export these batteries. The processes utilised for battery recycling in Europe are controlled by the requirements of IPPC, shipment elsewhere in the world would not be permitted. The closure of lead smelters within the UK would also impact on other sectors within the UK. Those companies recycling other lead products would have no management route for their wastes and would also have to close. This would lead to the import of primary lead. The question remains that without the metals recycling industry what will happen to the 8.5 million batteries each year? The situation may be exacerbated by the announcement on the 5th September by Xstrata that they have entered into a 30-day discussion with the unions at the Northfleet site, which may result in the closure of the battery recycling facility.

The non-ferrous metals industry is trying to find solutions to this very difficult issue. However the time available is short and the consequences of only a storage option are high, not just for those directly and indirectly employed as a result of these activities in the UK. The facilities for metals recycling are critical for the industry's excellent recycling rate performance to continue and for the achievement of other legislatively driven targets such as for recycled materials into new products. Aluminium is environmentally the best option in many applications. Failure to find solutions to the difficult issues outlined will result in the losses in the UK primary aluminium sector, and continue the decline in other sectors.

1. BACKGROUND TO THE POLICIES AND MARKET CONDITIONS

Government Policies derived from:

- Landfill Directive 99/31EC
- Waste Framework Directive 75/442 EC and the European Waste Catalogue
- PPC Directive 96/91 EC
- Environmental Liability Directive
- Groundwater Regulations and Water Framework Directive
- Waste Incineration Directive 200/76 EC
- Large Combustion Plant Directive 2001/80 EC
- Structures of Tax and Excise Duties Directive 92/81 EC
- Batteries Directive
- End of Life Vehicle Directive
- Waste Electrical and Electronic Equipment Directive

2. LIKELY FUTURE ARISINGS OF NON FERROUS METALS INDUSTRY WASTE CONSIDERING THE MARKET CONDITIONS AND PRODUCERS RESPONSE TO FORTHCOMING LEGISLATION

2.1 *Quantifying the waste arising and waste minimisation in the non ferrous metal sector*

Current waste arisings of particular concern are indicated in Table 1

Table 1

Type	Process	Hazard	Quantity (tonnes per annum)
Furnace Slag from Lead Smelting	Pyro-metallurgic	EWC 10.04.01	23 000
Salt Slag	Pyro-metallurgic	EWC 10.03.08	60 000
Dross Mill Dust	Milling	EWC 10.03.21	25 000
Abatement Equipment Dust	Abatement	EWC 10.03.23 (+ 20% H4)	8000
Refractory	Pyro-metallurgic	EWC 16.11.04 EWC 16.11.03	1000
Spent Pot Lining (SPL)	Electrolytic Aluminium Smelting	EWC 16.11.01	10 000
Tar and other carbon containing waste	Anode manufacture	10.03.01	2000
Shotblast fines	Metal finishing	10.03.12	500

The minimisation, treatment and disposal options considered for these wastes are outlined in Table 2

Table 2

Option	
Reduction	The non ferrous metals industry contributes significantly to reduction of waste arising. • Of the 200k tonnes of lead containing waste arising, 100k tonnes of lead metal are recovered with a relatively small residual furnace slag arising of 23k tonnes. There is a very low lead content in the furnace slag. Only 0.4 % of the gross recycled lead remains unrecovered. • The aluminium recyclers recover in the region of 1 million tonnes of aluminium with a relatively small residual salt slag residue of 25k tonnes. • The primary aluminium industry produces in the region of 350k tonnes per annum. 10k tonnes of Spent Pot Lining (SPL) is generated as a result. Technological advances have extended pot life which has in turn dramatically reduced waste to landfill. The residues from these activities are kept to an absolute minimum, however they still have to be managed
Recovery to avoid landfill	£2 million has been spent to find a potential treatment option for furnace slag from lead smelters to avoid landfill. Three key technical solutions have been explored and discounted. • biological oxidation of sulphur – produces a dilute sodium sulphate solution which could not be disposed of • fluidised bed electrolysis – technical difficulties could not be overcome • de-sulphurisation using hydro/pyro treatment – residues produced would remain hazardous. A project is now underway to explore the potential for sulphur recovery from soda slag. If this is shown to be technically feasible then the lead-time for implementation would be 3 years with an anticipated expenditure of > £5 million at each of the two UK lead smelters. Technical difficulties, in light of the recently published WAC, still need resolution. One salt slag recovery operation exists in the UK with limited capacity. Additional capacity is planned however there is a undetermined lead-time associated with this and it has been indicated that investment by waste treatment companies may only be driven by certain markets – even to the point of waiting until stockpiles appear. The use of dross mill dust within aggregate is currently being explored. Although this has proven successful the capacity within the aggregates industry is small and does not provide a total solution. The use of alkaline dust from abatement equipment for use in the neutralisation of acid waste has been extensively explored. The

	nature of these dusts makes them difficult to handle requiring specialist equipment. Opportunities within the waste management industry for utilisation of these dusts are actively being sought. Many millions of pounds have been spent worldwide to establish processes to treat SPL. No process has been developed which removes the need for landfill. Processes that have been piloted produce higher volumes of less hazardous waste. These less hazardous materials have potential for alternative uses in construction or as alternative fuels. However there are many legislative obstacles to their utilisation. Examples of treatment processes include: - • Low Caustic Liming and Leaching Process – hydrometallurgical process where finely divided SPL is digested in dilute caustic solution. Cyanides are decomposed using thermal alkaline hydrolysis. • Comtor Process – Calcination of finely divided SPL followed by fluoride recovery. • Reynolds Process – Thermal treatment with sand and limestone. Barriers to implementation: - • Reduced hazard but increased volume product however it is currently not possible to establish whether WAC for non-hazardous landfill could be met. • No such process is available in the UK • Lead-time for such a facility would be at least 2 years – once it could be established that any product could meet non-hazardous WAC. • Treatment processes are only viable for large volumes – UK only produces 10 000 tonnes per annum • Investment costs for such a facility is high – lack of clarity on requirements prohibits investment decisions • Production processes in the UK have large geographical spread which would mean high transport costs to a treatment facility In all cases WAC are not fully determined and therefore investment decisions not possible
Treatment to stable and non reactive	Opportunities for the treatment of furnace slag from lead smelting to make this waste stable and non reactive have not provided practicable solutions. Options explored have indicated that this may produce a stable and non reactive waste but would reduce the processing capacity of the smelters by 50% for a 50% increased volume of waste. Investment of around £5 million would be required at one of the smelters to upgrade the plant to take the same number of batteries – which would in turn lead to a doubling of waste quantity. This would lead to closure of the recycling smelters in the UK.

	Options for stable and non reactive treatment are being considered for the salt slag, dross mill dust, abatement dust and spent pot lining with no solutions at present identified In all cases WAC are not fully determined – with particular reference to ANC and therefore investment decisions not possible
Continued hazardous waste landfill	Entry into hazardous waste landfill following July 04 will be severely impaired due to the small number of sites available. In theory National Interim Waste Acceptance Criteria should allow for continued landfill in hazardous sites until July 05 providing risk assessment demonstrates no negative contribution to the environment. Although indications are that the PPC Permitting process could terminate co-disposal earlier than July 04 timescale officially identified. Introduction in the UK of European WAC in 2005 without the potential for risk assessment for specific wastes to specific sites will lead to site storage issues. Discussions have been held with waste management operators for “dry tomb” landfill of SPL. However this option cannot be confirmed as viable at present. In all cases WAC are not fully determined – with particular reference to ANC and therefore investment decisions not possible
Export	SPL and lead containing wastes are categorised as Red List waste therefore transboundary shipment is undesirable, costly and against the principles of the Convention Export of SPL to Norway where an offshore limestone quarry is being utilised for SPL has been considered however the transboundary shipment issues remain.
Storage in salt mines	Options have been explored however facilities to cater for the large quantities of waste expected are not demonstrably available. WAC could not be met.
Storage	If this is the only option left to the industry then operations will rapidly cease and sites close with the loss of recycling capacity and primary aluminium sector in the UK

3. POLICY RESPONSE

Policy Response

Policy needs to reflect the positive contributions made by the industry to the environment namely metals recycling and use of aluminium for environmental benefit along side the environmental benefits to be delivered by the Landfill Regulations. Industry believes that there will be a need for an integrated and best practicable solution, which may only be found by producers, the waste industry, regulators and the government working together. The environment must be protected however it will not be so if the metals recycling industry or the primary aluminium industry in the UK are lost. Implementation of the Landfill Directive in the UK must recognise a risk assessment basis for environmental protection.

UK Policy should balance the three pillars of sustainability. Environmental objectives must be balanced with social and economic objectives.

Policy Deliverables

Clarity is required for the industry to make investments decisions. Reasonable timescales are required for investments to be made or solutions to be found where none exist at present. Any alternatives to landfill must not incur greater risks to the environment or human health than landfill.

4. KEY DECISIONS AND TARGETS

- **Producers**
  - Continue to seek alternatives to landfill and treatment technologies where not presently available
  - Pursue improved process technologies for further waste minimisation over natural investment cycles
  - Continue to engage the waste management industry to determine solutions
  - Determine true availability of options once Waste Acceptance Criteria fully known
  - Determine investment requirements once Waste Acceptance Criteria fully known
  - Pursue synergies with other operators

- **Waste Industry**
  - Engage with the industry to determine solutions (e.g. use of alkali wastes in acid neutralisation)
  - Engage with producers to source solutions

- **Regulators**
  - Engage the industry to ensure that all that could be done to determine technological solutions is being done
  - Provide pragmatic approach to hazard and risk management – when does a hazardous material stop being a hazard?
  - Assist industry to pursue alternatives to landfill where waste definition prohibits use in alternative but environmentally beneficial uses

- **Government**
  - Provide clear details of implementation of the Landfill Directive in the UK
  - Ensure that the risk assessment approach provided by the European Waste Acceptance Criteria is provided for in UK legislation
  - Liase with the Environment Agency to ensure that suitable resource is made available for the risk assessment approach to be operated effectively
  - Ensure that full and detailed risk assessments are completed before EU legislation accepted
  - Plan for potential that the waste industry will not provide for metal recycling or primary aluminium wastes
  - Accept that all recycling produces an irreducible minimum waste which must be dealt with
  - Consideration of how other EU countries support recycling and metals industries

(Input co-ordinated by the Non Ferrous Alliance)